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Internal gas target experiments at the LHC

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New physics frontiers can be opened by using internal gas targets at the LHC. The various collision systems like pp, pA and PbA at energies varying from $\sqrt{s_{NN}}=72$ GeV to $\sqrt{s}=115$ GeV, and the implicit forward kinematic of the collisions, make accessible a broad programme of measurements, from the large-x frontier for particle and astroparticle physics to spin and heavy-ion physics. A first step into this new technology has been tested successfully at LHCb, specifically designed for Drell-Yan, quarkonia and heavy-flavour studies, with the SMOG system. An improved gas target, based on a storage cell (SMOG2), will be installed in the LHC Long Shutdown 2, subject to final approval. This will pave the way to quantitative searches in QCD through the study of the nucleon's internal dynamics in terms of both quarks and gluon degrees of freedom. Furthermore, in LHCb, final states with c- or b-quarks (e.g. inclusive quarkonia production) will be efficiently reconstructed, thus providing precious information on the so-far unknown gluon TMDs. In addition, SMOG2 will also act as R&D for the already proposed Polarised Gas Target (PGT). Here, with the use of the transversely polarized H and D targets, among several measurements, the quark TMDs in pp collisions, at unique kinematic conditions, can be determined. The status of the LHCb project and proposals related to the ALICE experiment will be presented.

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